



2005/2006 Fine Sediment Experiment Update

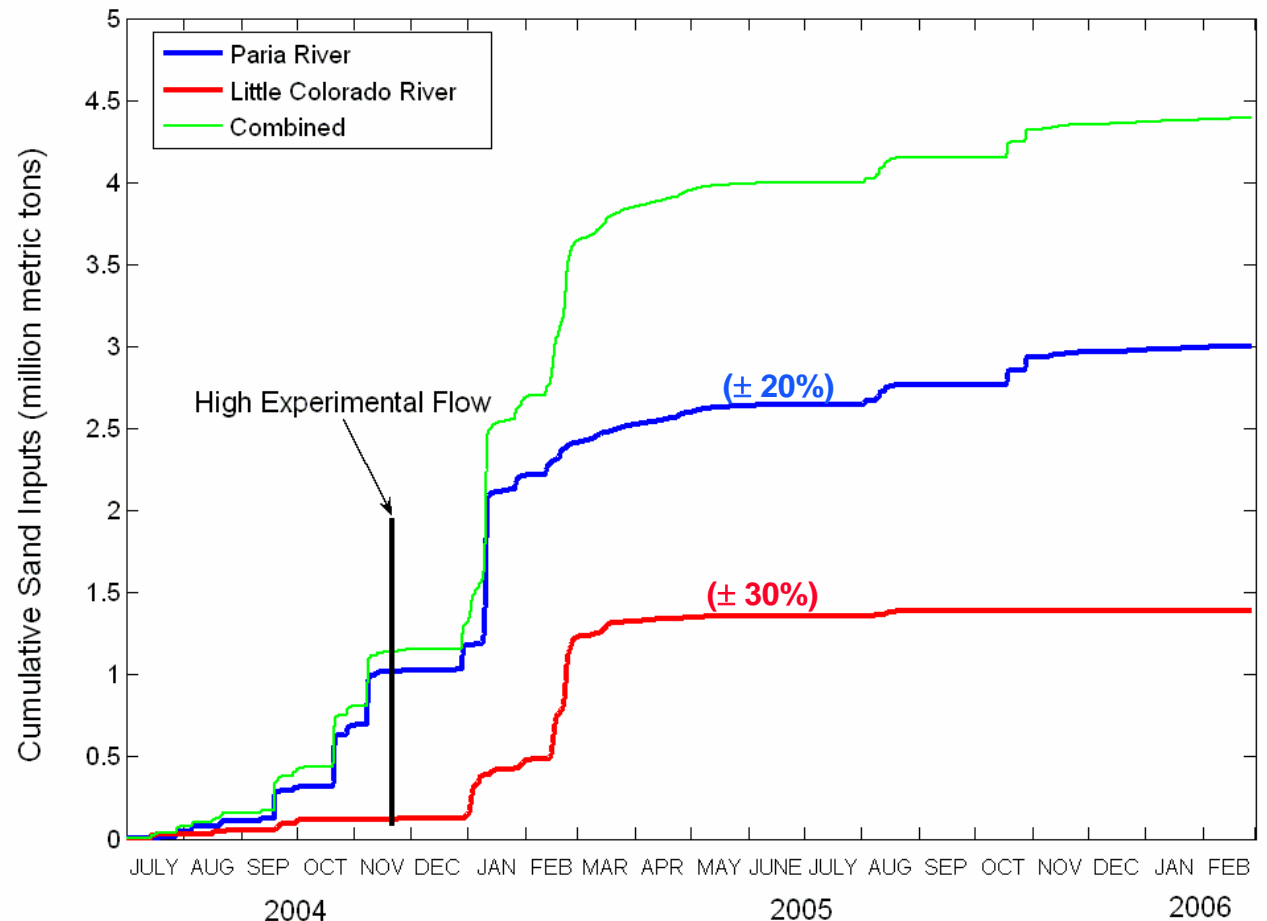
March 8 2006

Outline

- Update on 2005/2006 tributary sand inputs and mainstem export – sand mass balance
 - Update on Specific Experimental Elements:
 - Non-native Fish Suppression Flows (5,000 – 20,000 cfs)
 - Alternating Low Steady and Low Fluctuating Flows (6,500 – 9,000 cfs versus steady 8,000 cfs)
 - November 2004 High Experimental Flow
 - Summary of mass balance and experimental findings
-

2005/06 Tributary Sand Inputs

~ 3.5 million metric tons of sand have come in since Nov 2004



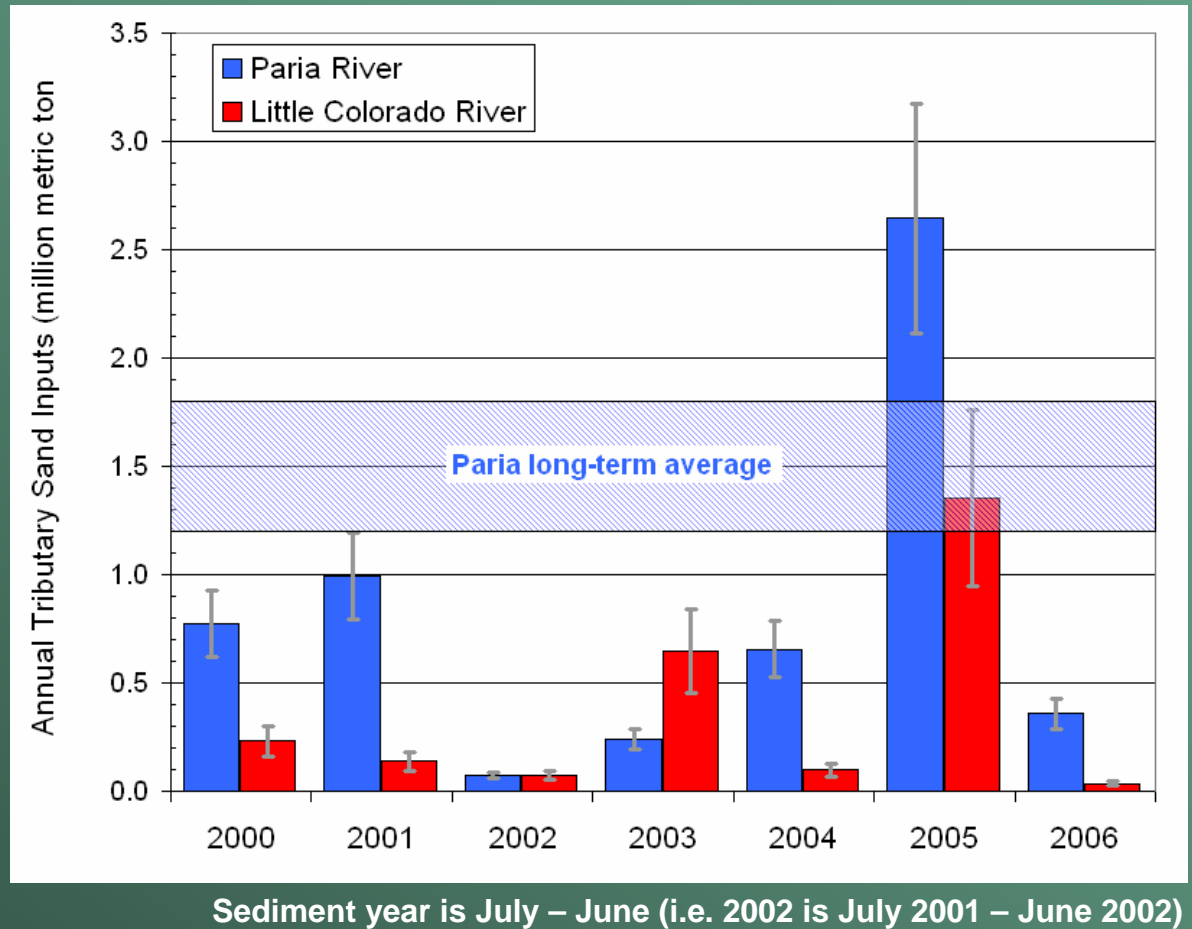
Smaller tributary inputs additional 10-20% of Paria



Preliminary data subject to review and revision

Tributary Sand Inputs Summary

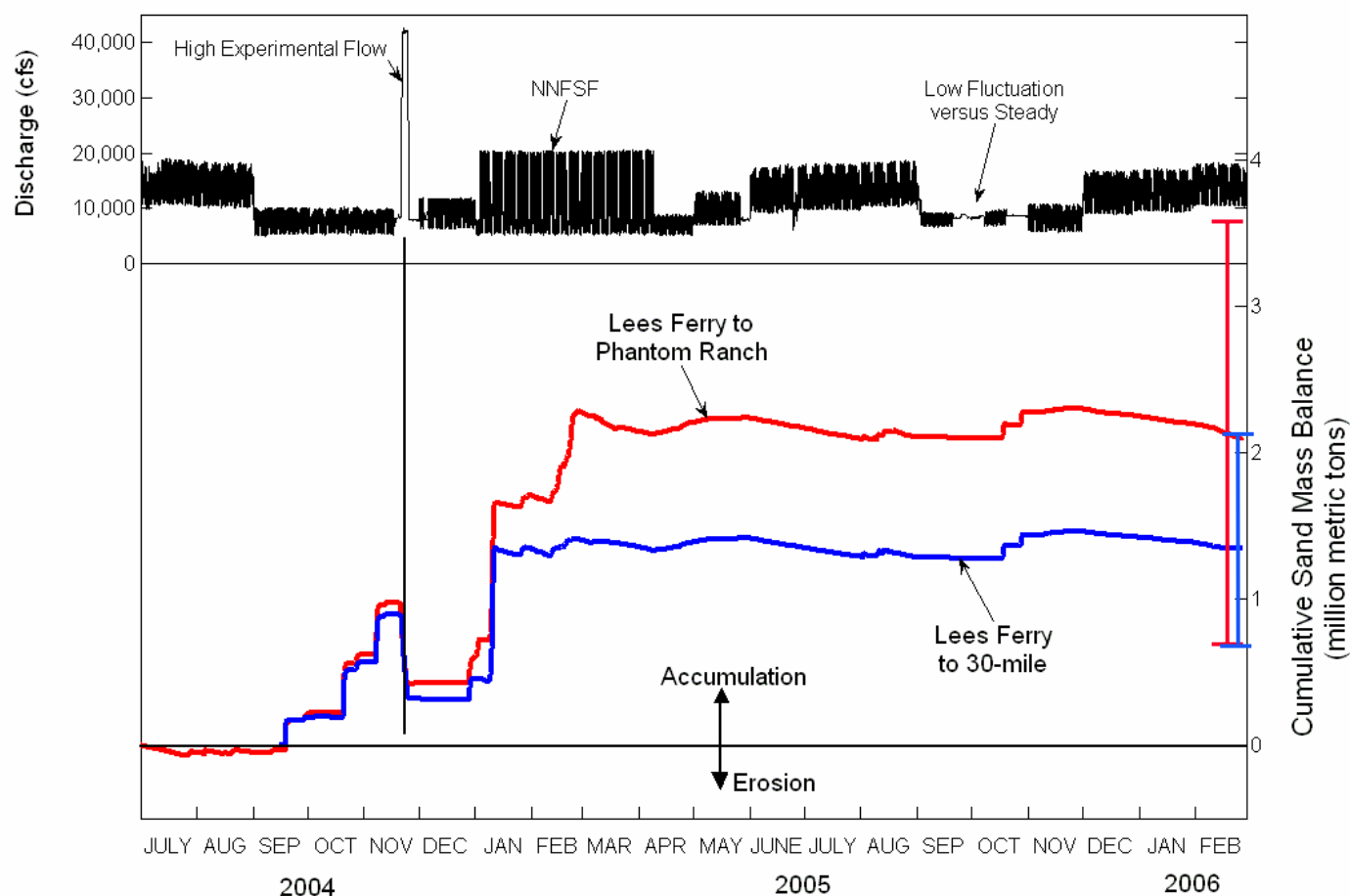
Inputs below average except for “sediment year” 2005



Preliminary data subject to review and revision

2005/06 Sand Mass Balance Update

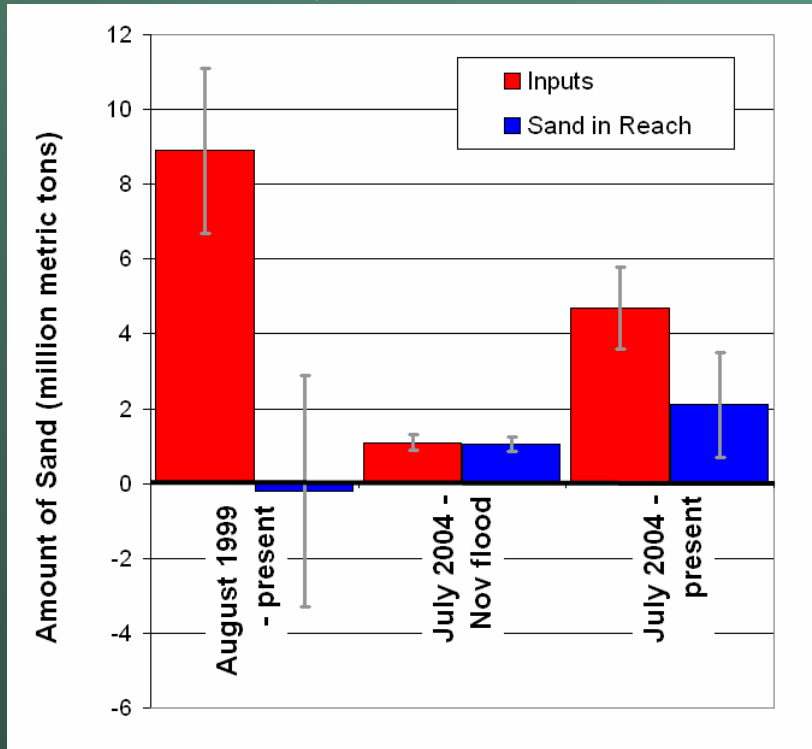
Export after high flow has been less than previous data would indicate



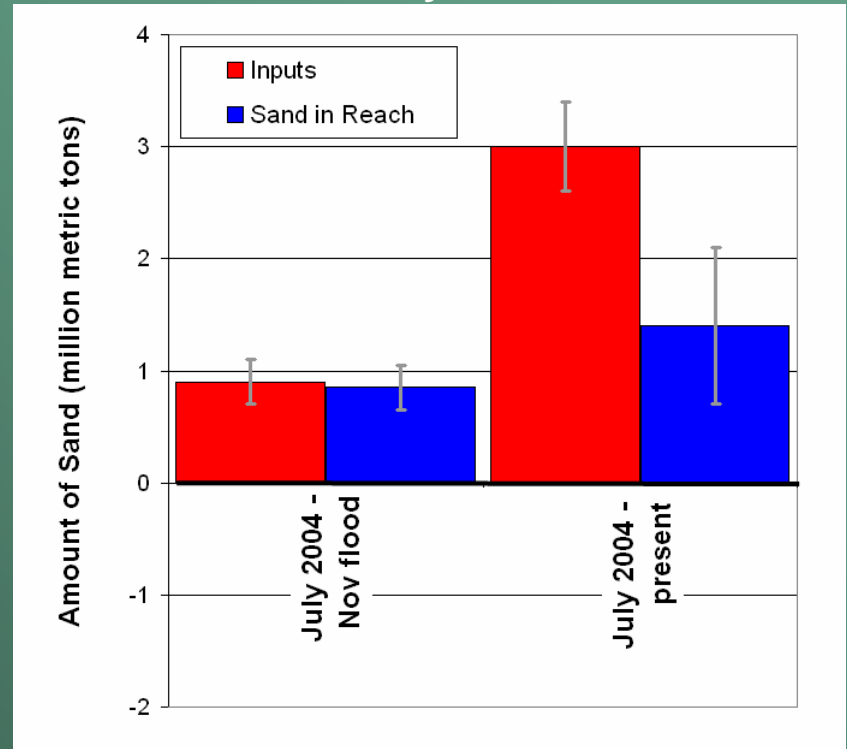
Preliminary data subject to review and revision

Sand Mass Balance Summary

Lees Ferry to Phantom Ranch



Lees Ferry to 30-mile



Comparable amount of sand in system now as before Nov 2004 flood



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Non-Native Fish Suppression Flows

- EXP Fluctuating flows from 5,000 – 20,000 cfs in January – March (2003, 2004, 2005)
 - Transport about twice as much sand as MLLF for similar volume months (and similar inputs)
 - Caused significant export and sandbar erosion following November 2004 High Experimental Flow

Alternating Low Steady and Low Fluctuating Flows

- Alternating two-week blocks of steady 8,000 cfs and 6,500 – 9,000 cfs (Sep/Oct 2005)
 - Low fluctuating flows transported ~10-20% more sand than steady flows, as expected from theory
 - Transport is so small at these flows that difference is not relevant to mass balance (transport during EXP 5-20 kcfs was ~ 25 times these flows)
 - Small fluctuation could make a significant difference to sand mass balance at higher volumes

Summary – Flows and Sand Transport

Flow Regime	Months	Volume (TAF)	Inputs	Export	Average retained
5 – 10	9	490	1.6 ± 0.40	0.2 ± 0.02	82 – 91%
7 – 13	18	610	1.3 ± 0.33	0.4 ± 0.04	55 – 78%
11 – 18	23	850	1.0 ± 0.25	2.4 ± 0.24	– (73 – 250)%

Based on data from August 1999 – February 2006

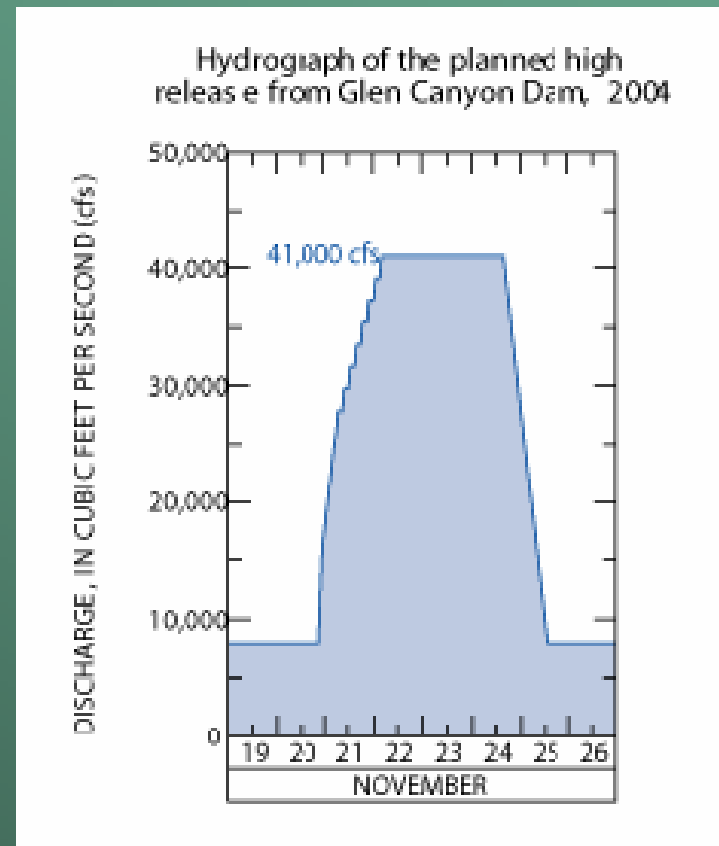
**Low to moderate volumes/peaks retained sand.
High volumes/peaks exported more sand than came in.**



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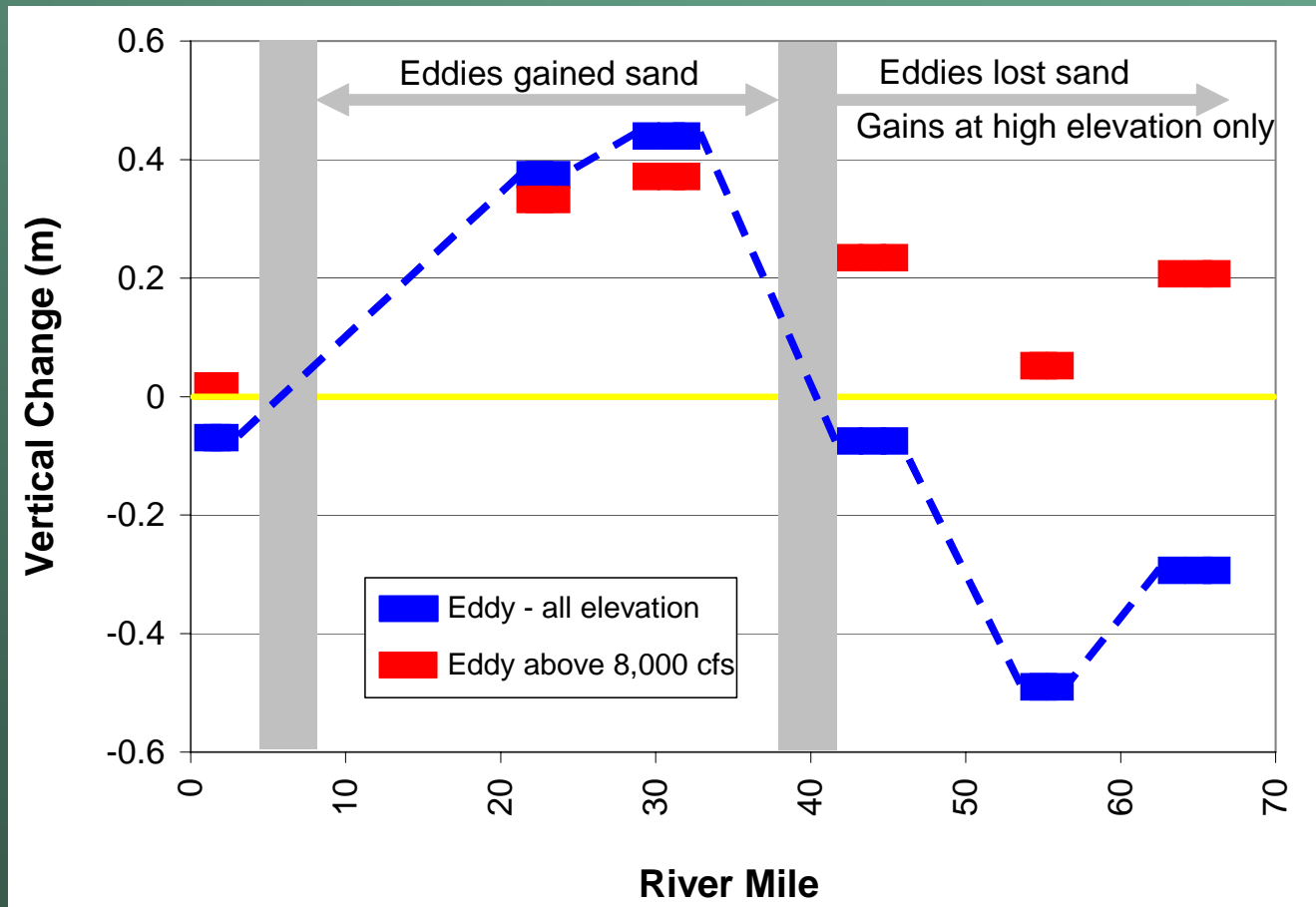
November 2004 High Experimental Flow

- Inputs exceeded trigger in Nov 2004
- Hydrograph with 60-hour peak of 41,000 cfs released from GCD starting Nov 21



November 2004 High Experimental Flow

- Reach surveys (FIST)
- ~ 3 mile reaches; 10-20 eddies per reach



November 2004 High Experimental Flow

- Sandbar erosion following high flow
 - 5 months following the experiment (NAU surveys):
 - > 25 kcfs: 25% OF FLOOD SAND ERODED
 - 8 – 25 kcfs: 48% OF FLOOD SAND ERODED

Flows in these 5 months were ROD 6-12 kcfs in Dec, EXP 5-20 kcfs Jan – Apr 8, ROD 5-9 for rest of April

Significant inputs occurred during this period; sand mass balance was positive during sandbar erosion

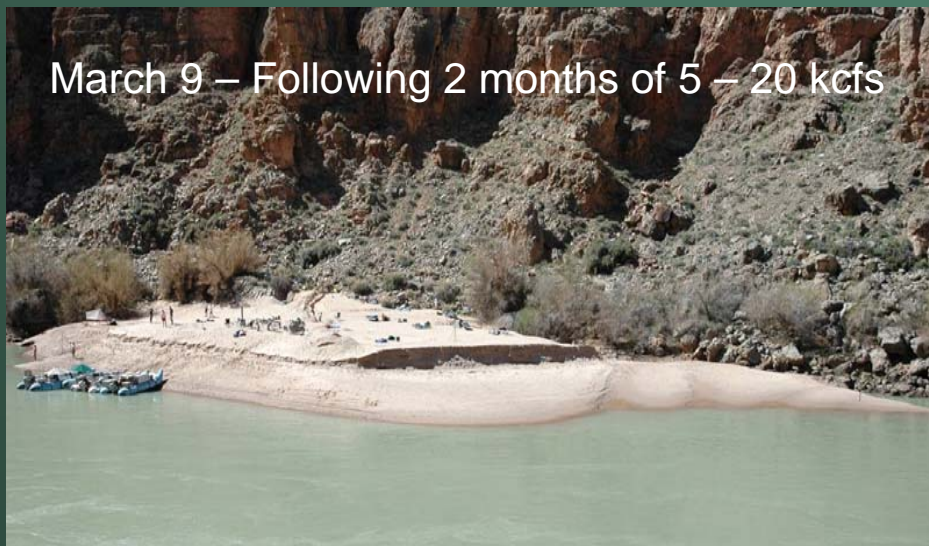


Preliminary data subject to review and revision

November 2004 High Experimental Flow



30-mile



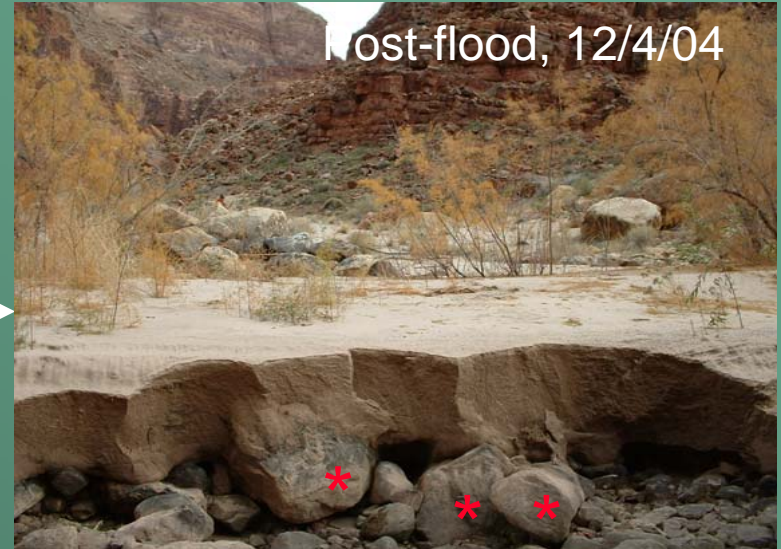
November 2004 High Experimental Flow



30-mile



November 2004 High Experimental Flow



24.5-mile



November 2004 High Experimental Flow

- **Physical habitat**
 - **Assessment of changes in backwaters awaiting final delivery of system-wide digital imagery flown in May 2005**
 - **Expected in the next month**

November 2004 High Experimental Flow

■ Summary

- In Upper Marble Canyon (to mile 40), more sand in eddies after than before high flow
- In Lower Marble and Eastern Grand Canyon, less sand in eddies after than before – accumulation at high elevation at expense of low elevation
- Sandbars relatively stable under ROD 6-12 kcfs in December. Significant sandbar erosion during EXP 5-20 kcfs in Jan-Mar 2005



Preliminary data subject to review and revision

Overall Summary

- The Nov 04 high flow resulted in net gains of sand in eddies above mile 40, but there was not enough sand for system-wide restoration and post-flood erosion rates were high
- Since Aug 99, the overall sand mass balance between Lees Ferry and Phantom Ranch is within measurement error (i.e. could be + or -)
- Export following the 2004 high flow has been less than expected based on previous data under comparable conditions
- There is a comparable amount sand in Marble Canyon and Eastern Grand Canyon now as before the 2004 high flow



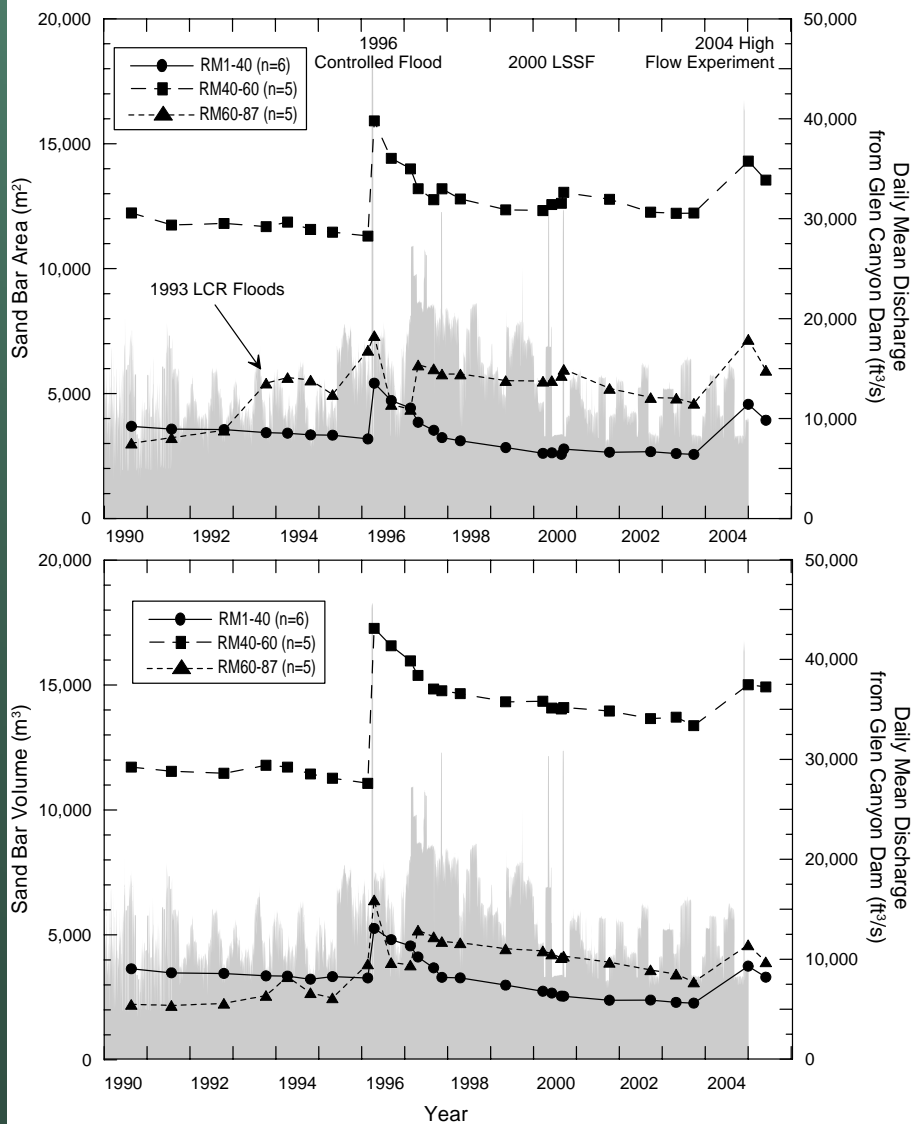
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Thank You

Questions?



Sand Bar Area and Volume above 25,000 ft³/s
in Marble Canyon and Eastern Grand Canyon



Sand Bar Area and Volume above 8,000 ft³/s
in Marble Canyon and Eastern Grand Canyon

